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Docket No. 8733.120.01
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Woo-Sup SHIN

Customer No. 30827

Application No. 09/039,438

Confirmation No. 9576

Filed: March 16, 1998

Art Unit: 1763

For: ETCHING APPARATUS

Examiner: ZERVIGON, Rudy

MS Appeal Brief – Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPELLANTS' REPLY BRIEF

Sir:

In response to an Examiner's Answer that was mailed on November 1, 2007, and the Supplemental Office Communication that was mailed on November 30, 2007, Appellants hereby submit this Reply Brief. No fees are currently due in response to the Examiner's Answer.

This brief contains items under the following headings as required by 37 C.F.R. § 41.37(c):

- I. STATUS OF CLAIMS**
- II. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**
- III. ARGUMENT**

I. STATUS OF CLAIMS

Total Number of Claims in the Application

There are 26 claims pending in the application.

Current Status of Claims

Claims canceled: N/A

Claims withdrawn from consideration but not canceled: N/A

Claims pending: 1-26

Claims allowed: N/A

Claims rejected: 1-26

Claims On Appeal: The claims on appeal are claims 1-26.

II. GROUND OF REJECTION TO BE REVIEWED ON APPEAL

The Examiner rejected claims 1, 2, 7, 10, 11, 13, 14, 17-22, 25 and 26 under 35 U.S.C. §103(a) as allegedly being unpatentable over U.S. Patent No. 3,532,568 to Schutt ("Schutt"), in view of U.S. Patent No. 5,000,795 to Chung et al. ("Chung"), U.S. Patent 4,338,157 to Kanda ("Kanda"), and U.S. Patent No. 5,560,838 to Allies et al. ("Allies"). Further, the Examiner rejected claims 3-6, 8, 9, 12, 15, 23 and 24 under 35 U.S.C. §103(a) as allegedly being unpatentable over Schutt in view of Chung, Kanda and Allies, further in view of U.S. Patent No. 3,869,313 to Jones et al. ("Jones"). Finally, the Examiner rejects claim 16 under 35 U.S.C. §103(a) as allegedly being unpatentable over Schutt in view of Chung, Kanda, and Allies, further in view of U.S. Patent No. 4,886,590 to Tittle ("Tittle").

III. ARGUMENT

- A. The Examiner improperly rejected claims 1, 2, 7, 10, 11, 13, 14, 17-22, 25 and 26 under 35 U.S.C. § 103(a) as being unpatentable over Schutt in view of Chung, Kanda, and Allies.

The Board's attention is again directed to a bit of the history of this case. A first Final Office Action was mailed in April 5, 2005 rejecting all of the claims. A Notice of Appeal was filed on July 6, 2005, and on January 6, 2005 an Appeal Brief ("prior Appeal Brief") was filed. On March 24, 2006, in response to the prior Appeal Brief, a Non-final Office Action was mailed. This Non-final Office Action states that prosecution is reopened and that a new ground of rejection is set forth in the Non-final Office Action. Upon careful review of the Non-final Office Action, it is noted that the rejection of claims 1, 2, 7, 10, 11, 14, 17-22, 25, and 26 is nearly identical to the rejection of these claims in first Final Rejection mailed April 8, 2005. The differences relate to replacing the previous primary reference Nelson with a new primary reference Schutt. Both Nelson and Schutt were relied on to teach similar features. So specific references to Nelson and elements in Nelson have been simply changed to specific references to Schutt and elements in Schutt. Some additional language, totaling about two sentences, in the previous Final Rejection was also removed from the present rejection. So it would seem to the applicants, that if the arguments in the Appeal Brief overcame the previous rejection, how simply swapping primary references and making the same exact arguments changes anything. Appellants respectfully assert that if the previous arguments overcame Nelson and the other art cited, that the same arguments overcome Schutt as currently cited and the other art cited. The Examiner has not provided a substantively new argument, hence the currently pending claims are allowable over Schutt and the other cited art.

In response to this argument the Examiner stated:

Applicant states that his prior arguments under a now un-applied reference to Nelson remain effective and applicable. The Examiner disagrees. In particular, the "appearance" of the Examiner's rejection remains consistent from the final action because, for example, the claimed invention has not changed significantly or at all. As a result, Applicant's prior arguments based upon the now un-applied reference to Nelson are moot.

In response to Appellants' brief, the Examiner states that the present case was inherited from a prior Examiner and that credit was given to the prior Examiner's search on page 9 of the

Examiner's Answer. However, the present Examiner did consider Nelson in light of Appellants' arguments. Again, Appellants wish to simply point out that as Schutt has replaced Nelson in the rejection and the language of the rejection is nearly identical that Schutt has the same flaws as Nelson as applied in the rejection. Further, the arguments put forth in the prior Appeal Brief regarding Nelson were persuasive enough to result in the Examiner issuing a Non-final Office Action. As a result, it would seem that the same arguments as previously put forth would overcome Schutt in combination with the other cited references as the Examiner has not identified how Schutt specifically teaches aspects of the present invention in a way that Nelson did not.

In order to support a rejection under 35 U.S.C. §103(a), the Action must establish a *prima facie* case of obviousness. To establish a *prima facie* case of obviousness the applied references must be combinable, there must be a reasonable expectation of success, and the combination must teach each and every claimed element. In the present case, claims 1, 2, 7, 10, 11, 13, 14, 17-22, 25 and 26 are not rendered unpatentable over the combination of Schutt, Chung, Kanda, and Allies because the Examiner fails to establish a *prima facie* case of obviousness as discussed below.

Independent claim 1 defines an etching apparatus for etching a glass substrate. The apparatus includes, *inter alia*, "a first tank including a first etchant," "an etch bath having a bubble plate, the glass substrate immersed in the first etchant and the etch bath connected to the first tank and receiving the first etchant, the etch bath containing a residual etchant including a diluted etchant and residue material after the glass substrate is etched with the first etchant, wherein a thickness of the glass substrate is uniformly reduced," and "a control unit controlling the first tank, the etch bath and the second tank, the control unit terminating the etching when a temperature of the first etchant reaches a termination temperature."

In rejecting claim 1, the Examiner asserts that Schutt discloses all of the claimed elements except an etch bath including a bubble plate and etching a glass substrate by immersion therein. The Examiner cites Schutt as "chemically etching ('etching zone 1'; Sole figure) material from a substrate (copper, abstract)." So Schutt does not teach an etch bath that etches a glass substrate to uniformly reduce the thickness of the glass substrate. Rather, Schutt is directed to etching copper from off of a substrate, specifically a printed circuit board. Such a process is typically intended to form conductive patterns on the printed circuit board. Hence, etching a

material uniformly to reduce its thickness is completely counter to the goal of Schutt. Thus, Schutt teaches away from the present claims and one of ordinary skill in the art would not look to Schutt. Accordingly, Schutt and the other cited references fail to teach every feature of the claimed invention.

The Examiner asserts that it would have been obvious to one skilled in the art to replace the etching zone 1 of Schutt with the wafer tank and bubble plate of Chung. This assertion is unfounded for the following reasons. The Examiner asserts that the motivation to replace the etchant delivery means with the a wafer cleaning tank including a bubble plate “would be to replace the etchant delivery means with an alternate and equivalent etching means,” however the Examiner fails to provide any evidence of the desirability of combining Schutt with Chung. Schutt is actually silent as to the specifics of the etching zone, because Schutt is actually directed to an etching solution having a ferrous ion for etching copper. Further, Chung is directed to a semiconductor wafer cleaning method and apparatus. The cleaning of Chung is a very different process from the etching of Schutt. Etching is a process of removing a specific material from a surface either in specific areas or in specific amounts. Cleaning is the removal of all undesired impurities, residues, etc. from a surface. Nowhere in the prior art is there any indication that the etching zone 1 of Schutt could be replaced with a bubble plate and tank of Chung. There is no indication in the prior art that one of ordinary skill in the art would replace the etching zone with a bubble plate and tank. In fact, as discussed below, the prior art actually teaches away from this combination. Furthermore, the Examiner asserts that the bubble plate is an alternative and equivalent etching means to the etchant delivery means, however, the Examiner fails to address the fact the bubble plate requires a gas supply which is not disclosed in Schutt. Accordingly, a significant redesign of the system of Schutt would be required in order to accommodate a bubble plate (i.e., the mere replacement of the etching zone with a etch bath is not possible). Further, Schutt is directed to etching copper and more specifically an etching solution to etch copper, and Chung is directed to cleaning semiconductor wafers. These two are directed to completely different problems and fields.

The Examiner argues that the pending apparatus claims should not be limited by the specific processes and that the process is an intended use of the apparatus on pages 10-11 of the Examiner’s Answer. However, the Examiner has admitted that Schutt does not teach an etch bath. The Examiner has admitted that Schutt does not disclose the structural features of the

apparatus. Thus, the Examiner's arguments with respect to intended use are misdirected, because the Examiner admits Schutt does not even teach the structural features of the apparatus. Further, the Examiner states that Chung and Schutt are combinable because liquid mixing in Chung would promote anisotropic etching on page 12 of the Examiner's Answer. However, liquid mixing is irrelevant in Schutt. That is, there is no effect or need to mix liquid. In Schutt, etching occurs by contact of the ferrous ions with the copper material.

Appellants submit that the apparatus of Schutt cannot be combined with the apparatus of Chung. The cleaning of Chung is a very different process from the etching of Schutt. Because the processes of both Chung and Schutt are so different, the apparatus. That is, portions of the apparatus of Chung cannot be used to perform the process of Schutt. Also, the apparatus of Schutt will not work in the process of Chung. MPEP 2143.01 states that "if proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion to make the proposed modification. In re Gordon, 733 F.2d 900 (Fed. Cir. 1984)." Here, Schutt is directed to an apparatus that is capable of using an acidic solution of ferric ion that is reduced to ferrous ion to etch a metal copper layer. Column 1, lines 32-40 and column 2, lines 10-20. One of ordinary skill in the art would not look to Schutt to etch a semiconductor wafer as in Chung, or a glass substrate, as in the present claims. One of ordinary skill in the art would realize that the acidic solution of Schutt, and the apparatus that Schutt discloses for use with the acidic solution, would not work on a glass substrate or semiconductor wafer. Schutt specifically discloses that the ferric ion acts as an oxidizing agent for the copper which is etched from the surface to form cupric ion while the ferric ion is reduced to ferrous ion. Column 2, lines 26-29. The apparatus of Schutt is designed to perform this function. One of ordinary skill in the art would not look to an apparatus capable of enabling oxidation reactions when concerned with cleaning a wafer as in Chung. Therefore, absent proper reasons to combine the system of Schutt and Chung, the rejection of claims 1, 2, 7, 10, 11, 13, 14, 17-22, 25 and 26 is improper.

Kanda and Allies are cited as disclosing control systems for etching apparatuses. They do not disclose or suggest apparatus for etching a glass substrate that includes a first tank, an etch bath and a second tank as claimed.

In the Examiners Response to Arguments, he states that "etch bath" is not a structural limitation. Appellants disagree. A bath is clearly a structure that holds a liquid. An etch bath

happens to be a bath the holds an etching solution. Further, the Examiner states that Chung is in the field of applicant's endeavor -- wafer processing. While it is true that Chung is in the field of wafer processing, the present invention relates to etching a glass substrate such as that used in a liquid crystal display and not to wafer processing.

Because Schutt, Chung, Kanda and Allies each fail to disclose or suggest an etching apparatus for etching a glass substrate that includes a first tank, an etch bath and a second tank as claimed, the combination of these four references cannot possibly disclose or suggest said features. Therefore, even if one skilled in the art were to combine Schutt, Chung, Kanda and Allies, the combination would still fail to render claim 1 unpatentable for at least the reason that the combination fails to disclose each and every claimed element.

Independent claims 11, 21 and 26 each define an etching apparatus for etching a glass substrate with an etchant that includes, *inter alia*, a first tank, an etch bath, and a second/separation tank which are substantially the same as those recited in claim 1. Therefore, claims 11, 21 and 26 are patentably distinguishable over the combination of Schutt, Chung, Kanda, and Allies for at least those reasons presented above with respect to claim 1.

In addition, claims 2, 7, 13, 14, 17-19, and 25 variously depend from independent claims 1 and 11. Therefore, claims 2, 7, 13, 14, 17-19, and 25 are patentably distinguishable over the combination of Schutt, Chung, Kanda, and Allies for at least those reasons presented above with respect to claim 1.

Independent claim 10 defines an etching apparatus for etching a glass substrate with an etchant. The apparatus includes, *inter alia*, an etch bath receiving the substrate immersed into the etchant, the etch bath etching the glass substrate, wherein the thickness of the glass substrate is uniformly reduced; a temperature sensor installed in the etch bath, the temperature sensor measuring and monitoring a temperature of the etchant; and a control unit controlling the etch bath, the control unit connected to the temperature sensor for receiving a signal indicating a temperature of the etchant to terminate the etching when the temperature of the etchant reaches a termination temperature.

In rejecting claim 10, the Examiner asserts that Kanda discloses a process control system having a thermocouple for measuring the temperature of the etching solution used to etch a submerged substrate. In addition, the Examiner asserts that one skilled in the art would have been motivated to control the etching operation for the etching apparatus of Schutt and Chung

with the chemical processing control system of Kanda and Allies in order to detect the termination of etching appropriately and precisely as taught by Kanda by an alternate and equivalent means of detecting said termination in using “reaction energy”. These assertions are unfounded for the following reasons.

First, as discussed above with respect to claim 1, the Examiner fails to provide proper reasons to modify the system of Schutt to include an etch bath. Furthermore, nowhere in Schutt is there any reason to control the etching process based on the temperature of the etchant, because Schutt is directed to an etching solution and because the temperature of the reaction is irrelevant to the etching process. Accordingly, absent proper reasons to modify the system of the Schutt, the rejection of claim 10 is improper.

Furthermore, even if, *arguendo*, one skilled in the art were to combine Schutt, Chung, Kanda and Allies as suggested by the Examiner, the combination would still fail to render claim 10 unpatentable because the combination fails to disclose each and every claimed element.

Kanda discloses controlling the etching process based on the thickness of the substrate, which is calculated based on the speed of the etching process, which in turn is based on the temperature of the etchant. The mere fact that Kanda discloses measuring the temperature of the etchant solution is not equivalent to terminating the etching process when the temperature reaches a termination temperature. Nowhere in Kanda is there any disclosure or suggestion of determining a termination temperature, much less terminating the etching process once the termination temperature has been reached.

Because Schutt, Chung, Kanda and Allies each fail to disclose or suggest an etching apparatus that includes a temperature sensor and a control unit for terminating the etching process when the temperature of the etchant reaches a termination temperature, the combination of these four references cannot possibly disclose or suggest this feature. Therefore, even if one skilled in the art were to combine Schutt, Chung, Kanda and Allies the combination would still fail to render claim 10 unpatentable because the combination fails to disclose each and every claimed element.

Independent claim 22 defines an etching apparatus for etching a glass substrate that includes, *inter alia*, a temperature sensor and control unit substantially as recited in claim 10. Furthermore, claim 20 depends from independent claim 10. Accordingly, claims 20 and 22 are

patentable distinguishable over the combination of Schutt, Chung, Kanda and Allies for at least those reasons presented above with respect to claim 10.

For at least those reasons present above, Applicant respectfully requests reconsideration and withdrawal of the rejection of claims 1, 2, 7, 10, 11, 13, 14, 17-22, 25 and 26 under 35 U.S.C. §103(a).

- B. The Examiner improperly rejected claims 3-6, 8, 9, 12, 15, 23 and 24 under 35 U.S.C. § 103(a) as being unpatentable over Schutt in view of Chung, Kanda, and Allies, further in view of Jones.

Claims 3-6, 8, 9, 12 and 15 variously depend from independent claims 1 and 11. Therefore, claims 3-6, 8, 9, 12 and 15 are patentably distinguishable over the combination of Schutt, Chung, Kanda and Allies for at least those reasons presented above with respect to claims 1 and 11. In addition, independent claim 23 and claim 24 which depends therefrom, define an etching apparatus that includes, *inter alia*, a first tank, an etch bath and a second/separation tank as recited in claims 1 and 11. Therefore, claims 23 and 24 are patentably distinguishable over the combination of Schutt, Chung, Kanda and Allies for at least those reasons presented above with respect to claims 1 and 11.

Jones discloses an apparatus for automatic chemical processing of semi-conductors. However Jones fails to overcome the deficiencies of Schutt, Chung, Kanda and Allies. Because Schutt, Chung, Kanda, Allies and Jones each fail to disclose or suggest an etching apparatus for etching a glass substrate that includes a first tank, an etch bath, and a second/separation tank as claimed, the combination of these five references cannot possibly disclose or suggest said features. Therefore, even if one skilled in the art were to combine Schutt, Chung, Kanda, Allies, and Jones, the combination would still fail to render claims 3-6, 8, 9, 12, 15, 23 and 24 unpatentable for at least the reason that the combination fails to disclose each and every claimed element.

- C. The Examiner improperly rejected claim 16 under 35 U.S.C. § 103(a) as being unpatentable over Schutt in view of Chung, Kanda, and Allies, further in view of Tittle.

Claim 16 depends from independent claim 11. Therefore, claim 16 is patentably distinguishable over the combination of Schutt, Chung, Kanda and Allies for at least those

reasons presented above with respect to claim 11. Tittle discloses a chemical process control system. However, Tittle fails to overcome the deficiencies of Schutt, Chung, Kanda, and Allies.

Because Schutt, Chung, Kanda, Allies and Tittle each fail to disclose or suggest an etching apparatus for etching a glass substrate that includes a first tank, an etch bath, and a separation tank as claimed, the combination of these five references cannot possibly disclose or suggest said features. Therefore, even if one skilled in the art were to combine Schutt, Chung, Kanda, Allies, and Tittle, the combination would still fail to render claim 16 unpatentable for at least the reason that the combination fails to disclose each and every claimed element. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejection of claim 16 under 35 U.S.C. §103(a).

If these papers are not considered timely filed by the Patent and Trademark Office, then a petition is hereby made under 37 C.F.R. § 1.136, and any additional fees required under 37 C.F.R. § 1.136 for any necessary extension of time, or any other fees required to complete the filing of this response, may be charged to Deposit Account No. 50-0911. Please credit any overpayment to deposit Account No. 50-0911. A duplicate copy of this sheet is enclosed.

Dated: **2 January 2008**

Respectfully submitted,



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